ELECTRICAL CONNECTOR WITH A LOW PROFILE LATCH

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to electrical connectors and particularly to an electrical connector with a low profile latch.

[0002] Electrical connectors have been proposed with various features to afford secure mechanical and electrical engagement with a mating electrical connector or other mateable connecting device. Various latching systems have been used with electrical connectors to provide such secure engagement. It is desirable that the latch providing the secure engagement also afford easy attachment and detachment. For instance, latching mechanisms have been developed which include pivotally supported latching arms that interlock with each other or that interlock with a complementary latching mechanism of the mateable connector or connecting device. The latching arms of many connectors are pivotally mounted on the connector housings and often require a relatively long lever arm portion to pivot the latching arm to either engage or disengage the arm from a latch on the mating connecting device. This requires considerable space on the connector assembly which renders such connectors unsuitable for spatially constrained applications such as seat motor interfaces in automobiles.

[0003] In the automotive industry, heretofore, space constraints have prevented the use of a releasable latch at the connector that joins the seat electronics to the vehicle. Hence, seat connectors have employed a non-serviceable connection whereby the primary connector, once mated, is not intended to be disconnected. This usually results when space constraints render the primary connector either totally inaccessible or where there is not sufficient space for the connector to be manipulated as needed to perform a disconnect without damaging the connector. In such applications, a secondary connection has been provided in a manner and location that is serviceable. The

secondary connection can be disconnected to accommodate service and repair activities. Secondary connections are provided in applications where space is limited, such as in automotive seat applications. More specifically, the seat adjusting mechanism is driven by an electric motor which can only be serviced after removing the seat. Due to space limitations, a secondary serviceable connection is typically used to facilitate the removal of the seat. However, the use of secondary connections adds to product cost.

[0004] A need exists for a connector with a low profile latch for use in applications with close space constraints such as seat motor connections.

BRIEF DESCRIPTION OF THE INVENTION

[0005] In one aspect of the invention, an electrical connector includes a housing having a mating face that is configured to be mounted onto an electrical connector interface. A latch assembly is provided on a side wall of the housing. The latch assembly is oriented to extend along the side wall. The latch assembly has a latch element formed on an end thereof proximate the mating face, and includes mounting brackets separated from one another along a length of the latch assembly. The mounting brackets join the latch assembly to the side wall. The latch assembly has a portion between the mounting brackets that is deflectable toward the side wall.

[0006] In another aspect of the invention, an electrical connector includes a housing having a mating face that is configured to join an electrical connector interface. A shroud is provided on a side wall of the housing. The shroud has an outer flange spaced from the side wall to define a gap therebetween. A latch assembly is pivotally provided on the side wall and is oriented to extend along the side wall. The latch assembly has a latch element formed on an end thereof proximate the mating face. At least a forward portion of the latch assembly is located within the gap and is pivotal between the shroud and the side wall.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Figure 1 is a partial perspective view of a seat motor for an automotive application.

[0008] Figure 2 is a perspective view of an electrical interface for the seat motor of Figure 1.

[0009] Figure 3 is a front perspective view of an electrical connector formed in accordance with an embodiment of the present invention to join the electrical interface shown in Figure 3.

[0010] Figure 4 is a view of the connector of Figure 3 with a cut away showing latch assembly detail.

[0011] Figure 5 is a top view of a latch assembly from the connector of Figure 3.

[0012] Figure 6 is a partial front view of the mating face of the connector of Figure 3.

[0013] Figure 7 is a perspective view of a connector unmated to a seat motor interface;

[0014] Figure 8 is a perspective view of a connector partially mated to a seat motor interface.

[0015] Figures 9 and 10 are perspective views of a connector fully mated to a seat motor interface.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Figure 1 illustrates a seat motor 100 that is a height adjust motor and is used in an area of limited space on an automobile. Seat motor 100 includes a connector interface 200.

[0017] Figure 2 shows the connector interface 200 in greater detail which includes a base 210, a back wall 220, a support rib 230 centrally located on base 210 and an alignment rib 234 between the support rib 230 and the back wall 220. A pair of contacts 270 upwardly extend from base 210 proximate back wall 220. Additional contacts 272 are centrally positioned and upwardly extend from the base 210. Base 210 has flanges 260 outwardly projecting from each side thereof. Flanges 260 include a forward facing latching surface 262. Base 210 includes wing portions 250 on each side that extend from a rearward end 254 of the base 210 to the flange 260. For purposes of illustration, the term forward shall refer to a direction denoted by arrow A from the rear end 254 toward back wall 220 of connector interface 200. The connector interface 200 includes rails 240 that sit on the seat motor 100.

[0018] Figure 3 illustrates a connector 300 formed in accordance with an embodiment of the present invention for use with connector interface 200. The connector 300 has a mating face 320 and includes a housing 304 formed with a top wall 314, upper side walls 332, and lower side walls 330. A shroud 310 extends laterally from each of upper side walls 332 proximate the connector mating face 320. The outer portion of shroud 310 folds down to form a flange 316. The connector mating face 320 includes a number of contact cavities 390. The connector mating face 320 is configured to join the connector interface 200 (Figure 2) such that contact cavities 390 accept the contacts 270 and 272. The contact cavities 390 include contacts (not shown) that join contacts 270 and 272. The lower edges 340 of lower walls 330 may rest on the base 210 when the connector is joined with the connector interface 200.

[0019] A latch assembly 360 is attached to one or each of side walls 330 of connector 300. The forward end of the latch assembly 360 is below shroud 310. Each latch assembly 360 is oriented with a longitudinal axis of the latch assembly 360 extending along a length of the side wall 330. The latch assembly 360 includes parallel upper and lower beams 370 and 372 which extend along the side wall 330. A rear mounting bracket 400 joins upper and lower beams 370 and 372 to the side wall 330 through a base plate 362. Intermediate portions of the upper and lower beams 370 and 372 are joined to the side wall 330 through an intermediate mounting bracket 402 and the base plate 362. The shroud 310 and flange 316 overlap a forward portion of latch assembly 360. The shroud 310 and flange 316 operate to provide overstress protection at the forward portion of the latch assembly 360.

[0020] In Figure 4, the flange 316 is cut away to illustrate a latch element 374 at the forward end of latch assembly 360. The upper and lower beams 370 and 372 have lead ends that are joined proximate the connector mating face 320 by a cross bar. The cross bar forms the latch element 374 that engages flanges 260 and latching surfaces 262 on the base 210 when the connector 300 is joined to the connector interface 200. A grip element 380 is centrally positioned between rear and intermediate mounting brackets 400 and 402 connecting upper and lower beams 370 and 372.

[0021] The attachment and operation of the latch assembly 360 is shown with reference to Figures 5 and 6. The latch assembly 360 attaches to the housing lower side wall 330 through a base plate 362 and mounting brackets 400 and 402. Mounting brackets 400 and 402 provide attachments that are sufficiently rigid that shrouding or overstress protection features are not required in these areas. The latch assembly 360 is operated by applying inward lateral pressure on grip element 380 in the direction of arrow E which results in the deflection of beams 370 and 372 as indicated in dashed lines. Pressure at grip element 380 causes the span of beams 370 and 372 between the rigid mounting brackets 400 and 402 to deflect inward. The inward flexing of the beams 370 and 372 between the mounting brackets 400 and 402 causes the forward ends of the

beams 370 and 372, along with latch element 374, to move outward. The forward ends of the beams 370 and 372 with latch element 374 pivot laterally outward and inward about the intermediate mounting bracket 402 in the direction of arrows B and C as pressure is applied and removed from the grip element 380.

[0022] As best shown in Figure 6, the upper shroud 310 and flange 316 extend outward and down from side wall 330 to create a latch operating gap 392. The upper and lower beams 370 and 372 pivot within gap 392 over a range of movement limited by side wall 330 and flange 316. Grip portion 380 is normally biased away from the side wall 330 in a neutral position between the mounting brackets 400 and 402 when no activating pressure is applied. Inward pressure on grip portion 380 moving grip portion 380 toward side wall 330 causes the upper and lower beams 370 and 372 to move the latch element 374 outward away from the side wall 330 to a released position. The forward ends of beams 370 and 372 with latch element 374 pivot within gap 392 about a rotational axis 393 (Figure 6) through pivot post 402. The rotational axis 393 extends transversely through latch assembly 360 at an intermediate point along the length of the latch assembly 360. Gap 392 is oriented perpendicularly to the rotational axis 393.

[0023] The mating operation of connector 300 with connector interface 200 is shown progressively in Figures 7 through 10 and discussed hereafter. In Figure 7, connector 300 is positioned on base 210 of connector interface 200 at an initial position. Connector 300 is then advanced in the direction of arrow D (Figure 7) toward back wall 220 of interface 200. At the point shown in Figure 7, the connector 300 and connector interface 200 are unmated. In Figure 8, connector 300 is sufficiently advanced that the latch element 374 contacts flange 260 on the base 210. At this point (Figure 8), connector 300 and interface 200 are partially mated. However, latch element 374 is not fully engaged on the latching surface 262 of flange 260. In Figures 9 and 10, connector 300 is advanced until the cross bar 374 is fully engaged on the latching surface 262 of flange 260 at which position the mating operation is completed.

[0024] To separate connector 300 from interface 200, pressure is applied to grip portion 380 in the direction of arrow E (Figure 5) which causes beams 370 and 372 to pivot in the direction of arrow B, thereby moving latch element 374 out of engagement with latching surface 262 on flange 260 (e.g., to a non-overlapping position with flange 260) thus allowing connector 300 to be withdrawn from interface 200.

[0025] The embodiments thus described provide a low profile electrical connector for use in limited space applications. The connector includes a releasable latch that facilitates disengagement of the connector while assuring positive engagement of the connector and connector interface when mated. The connector affords a serviceable primary connection eliminating the need for secondary serviceable connections for applications such as automotive seat motor connections.

[0026] While the invention has been described in terms of various specific embodiments, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the claims.